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REMARKS

Claims 1-30 are pending. Claims 1, 2, 8, 9, 13-16, 23, and 24 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,973,816 to Haberman or U.S. Patent No. 5,278,388 to Huang. In addition, Claims 3-7, 10-12, 17-22, and 25-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Haberman or Huang.

THE REJECTIONS UNDER 35 U.S.C. § 102(B)

Claims 1, 2, 8, 9, 13-16, 23, and 24 were rejected under 35 U.S.C. § 102(b) as being anticipated by Haberman or Huang. Haberman discloses a plasma torch comprising a tubular body 22 and a nose 28 bonded thereto. An electrode 46 having an insert 48 at its axial tip is threaded to the end of the nose 28. Plasma gas or air flows into an annular passage 30 defined by the body 22 where it is divided into two branches, one represented by a series of radial ports 36 in the nose 28, and the other branch represented by a series of radial ports 38 also in the nose 28 and rearward of the ports 36.

Huang also discloses a plasma torch comprising a negative-electrode jacket 2 secured to a body 1. A negative-electrode terminal 4 is threadably connected to a lower portion of the negative-electrode jacket 2, and a nozzle 6 is positioned below the negative-electrode terminal 4 forming a main gas ionization passage 60 between the nozzle and the negative-electrode terminal. A main gas discharge hole 25 is formed in a lower portion of the negative-electrode jacket 2. Gas is directed down a central gas passage 33 into main gas passage 20 defined by a core tube 3, negative-electrode jacket 2, and negative-electrode terminal 4. A main gas discharge hole 25 is formed in a lower portion of the negative-electrode jacket 2 and is in fluid communication with the main gas passage 20 for delivering gas to the nozzle 6 to be discharged from the nozzle towards a workpiece. In addition, an over-pressure release valve 7 is also in fluid communication with the main gas passage 20 and is held on a valve seat 23 by a tension spring 72. If gas pressure flowing to the nozzle 6 is higher than a predetermined amount, the valve plug 71 will be opened from the valve seat 23 and a bypass gas flow will be discharged out of the gun body 1 through an over-pressure venting hole.

By contrast, the claims of the present invention define an electrode including an upper tubular member 23 and a metallic holder 41 defining a plurality of side openings 50 positioned

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proximate the front end of the holder, wherein all of the gas is directed to a nozzle chamber through the side openings defined by the holder. Therefore, the holder 41 of the present invention defines passages therethrough for directing all of the gas to the nozzle chamber 90. The holder 41 of the present invention is most accurately represented by the "electrode" 46 of Haberman and the "negative-electrode terminal" 4 of Huang, while the upper tubular member 23 of the present invention is most accurately represented by the "nose" 28 of Haberman and the "negative electrode jacket" 2 of Huang. Haberman, however, does not disclose openings defined in the electrode 46, and Huang does not disclose openings defined in the negative-electrode terminal 4. Instead, openings are defined in other components of the Haberman and Huang torches for directing the gas in a manner completely different from that of the claimed invention.

More specifically, independent Claim 1 of the present application requires that all of the gas directed from the central passageway to the nozzle chamber is directed through side openings defined by the holder. Similarly, independent Claim 8 requires that the gas can exit the central passageway only via the side openings positioned proximate the front end of the holder. Further, independent Claim 13 defines a method of operating a plasma torch including the step of directing a flow of gas from the central passageway into the nozzle chamber such that all of the gas is directed through side openings defined by the holder into the nozzle chamber. Accordingly, Claims 1, 8, and 13, as well as the claims that depend either directly or indirectly therefrom, are not anticipated by Haberman or Huang. It is therefore respectfully submitted that the rejections under 35 U.S.C. § 102(b) be withdrawn.

Claim 23 was also rejected under 35 U.S.C. § 102(b) over Haberman or Huang. Claim 23 discloses a method of operating a plasma arc torch including the steps of directing a flow of gas along a central passageway into the nozzle chamber such that all gas supplied into the central passageway enters the nozzle chamber, and splitting the flow of gas into at least a primary flow and a secondary flow by openings defined in the nozzle. More specifically, the nozzle 60 of the present invention is positioned proximate the holder 41 of the electrode 40. A plurality of openings 66 are defined in the nozzle 60 for splitting the plasma gas into a primary flow through a central bore 67 and a secondary flow through a secondary gas flow port 91. The nozzle 60 of the present invention is most accurately represented by a "tip" 42 in Haberman and a nozzle 6 of

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Huang. However, neither the tip 42 of Haberman nor the nozzle 6 of Huang defines openings therethrough for splitting a flow of gas into at least a primary flow and a secondary flow as required by Claim 23 of the present application. Accordingly, Claim 23, as well as the Claims that depend therefrom, are not anticipated by Haberman or Huang. Therefore, it is respectfully submitted that the rejections under 35 U.S.C. § 102(b) be withdrawn.

THE REJECTIONS UNDER 35 U.S.C. § 103(a)

Claims 3-7, 10-12, 17-22, and 25-30, all dependent claims, were rejected under § 103(a) as being unpatentable over Haberman or Huang. As discussed above, neither Haberman nor Huang teach or suggest openings defined by the holder and nozzle as required by the independent claims of the present application. Because neither Haberman nor Huang teach or suggest the subject matter of the independent claims, they cannot suggest the more limited dependent claims. Haberman and Huang simply do not teach or suggest the electrodes and methods according to the presently-claimed invention. Accordingly, it is respectfully submitted that the rejections under 35 U.S.C. § 103(a) be withdrawn.

NEW CLAIMS

Applicant has also added new Claims 31-35 that are directed to an electrode having an upper tubular member, a metallic holder, and a nozzle positioned proximate the front end of the holder and defining a nozzle chamber therebetween, wherein the nozzle further defines a plurality of secondary openings that create a secondary flow of gas therethrough. Neither Haberman nor Huang shows an electrode in which splitting of a main gas flow into primary and secondary flows occurs via openings in the nozzle. Accordingly, it is respectfully submitted that new Claims 31-35 are not taught or suggested by the cited references and are in condition for immediate allowance.

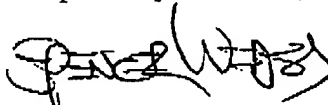
In summary, Applicant has discovered electrodes and methods of operating a plasma arc torch that provide advancements in the state of the art that are not taught or suggested by the cited references. It is therefore respectfully submitted that a Notice of Allowance be issued. The

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Examiner is encouraged to contact Applicant's undersigned attorney to resolve any remaining issues in order to expedite examination of the claimed invention.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,



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Version with Markings to Show Changes Made:

In The Claims:

Please add the following claims:

31. (New) An electrode adapted for supporting an arc in a plasma arc torch, comprising:
an upper tubular member defining an internal bore therethrough and a threaded portion at one end thereof;
a metallic tubular holder defining a longitudinal axis and having a front and rear end, and a transverse end wall closing the front end, the transverse end wall having a front face and defining a cavity formed in the front face extending rearwardly along the longitudinal axis, the rear end defining a central passageway in fluid communication with the internal bore for directing a gas to the front end of said holder, said holder further defining a plurality of side openings positioned proximate the front end of said holder that are in fluid communication with the central passageway such that the gas can exit the central passageway only via the side openings positioned proximate the front end of said holder; and
a nozzle positioned proximate the front end of said holder and defining a nozzle chamber therebetween, said nozzle defining a central bore for discharging a primary flow of gas from the nozzle chamber toward a workpiece located adjacent the nozzle, and further defining a plurality of secondary openings positioned across the nozzle chamber from the side openings at the front end of the holder for creating a secondary flow of gas therethrough.
32. (New) An electrode according to Claim 31, further comprising a valve assembly located in the internal bore of the upper tubular member, said ball valve assembly capable of regulating the gas through the electrode.

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33. (New) An electrode according to Claim 31, wherein the side openings in said holder are arranged to impart a swirling motion to the gas exiting the side openings.

34. (New) An electrode according to Claim 31, wherein the plurality of side openings defined by the holder are located at a position less than 1/2 the length of the holder along the longitudinal axis from the front face of the holder.

35. (New) An electrode according to Claim 31, wherein the holder includes a threaded portion for threadably securing the holder to the upper tubular member.